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(54) Title: ROUTING BETWEEN COMMUNICATION NETWORKS

(54) Titre: ACHEMINEMENT ENTRE RESEAUX DE COMMUNICATION

(57) Abstract

The present invention relates to a method of routing a call between a circuit switched network and a packet switched network in a network system comprising a media gateway between the circuit switched network and the packet switched network. In the method all routing procedures for the call are handled by a separate routing controller common for several media gateways. The invention relates further to an arrangement for performing the same.

(57) Abrégé

Cette invention a trait à une méthode d'acheminement d'un appel entre un réseau à commutation de circuit et un réseau à commutation de paquets dans un système en réseau comprenant une passerelle pour supports entre le réseau à commutation de circuit et le réseau à commutation de paquets. Dans le cadre de cette méthode, toutes les modalités d'acheminement de l'appel sont prises en charge par une unité de commande d'acheminement commune à plusieurs passerelles pour supports. L'invention porte également sur un dispositif permettant la mise en oeuvre de cette méthode.

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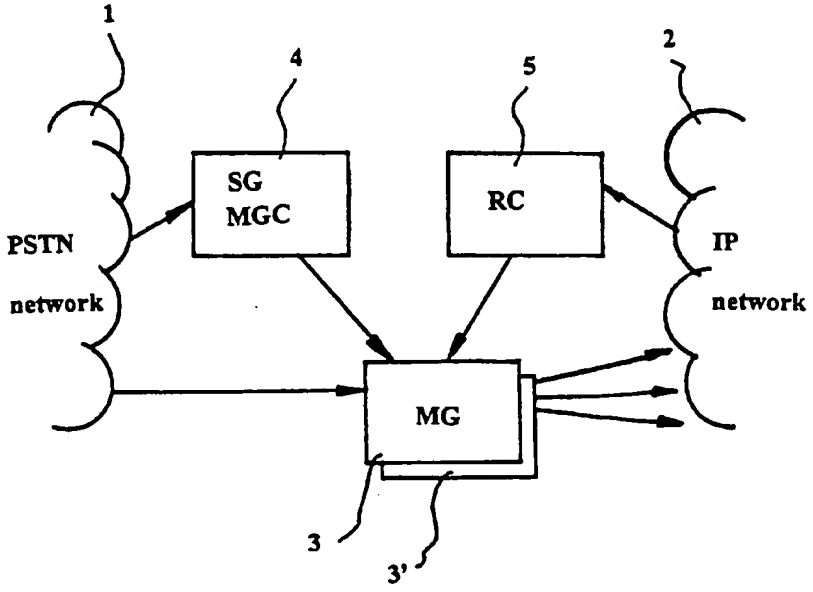

(57) Abstract

The present invention relates to a method of routing a call between a circuit switched network and a packet switched network in a network system comprising a media gateway between the circuit switched network and the packet switched network. In the method all routing procedures for the call are handled by a separate routing controller common for several media gateways. The invention relates further to an arrangement for performing the same.

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Description

ROUTING BETWEEN COMMUNICATION NETWORKS

FIELD OF THE INVENTION

The present invention relates to a method of routing in telecommunication networks, and more precisely to a method of routing between a telephone network and a data network. The invention relates further to an arrangement for performing the routing operations between two different networks.

BACKGROUND OF THE INVENTION

An interfacing gateway or access node is required in the communication path or route between two different communication networks. For instance, an interfacing access node is required in cases where the other network is a telephone network, such as a Public Switched Telephone Network (PSTN) and the other network is a data network, such as a packet switched data network (PSDN). Examples of the packet switched networks include the global connectionless Internet utilising TCP/IP (Transport Control Protocol/Internet Protocol) protocol suite and various Intranet applications.

One possibility to implement the access node AN between the PSTN and the packet switched data network is a routing device referred to as Network Access Server (NAS). NAS can be defined as a device which receives calls from the PSTN and translates the calls into Internet IP packet form.

At least some degree of routing functionality is required in the communication network system for the transmission of the data packets over the data network in order to be able to

sent the data packets to a correct next router and finally to a correct destination address. This functionality is usually integrated to the NAS, or then all traffic goes through a separate router especially and solely arranged to accomplish the routing tasks. Routing protocols based on international agreements are used in order to be able to provide this functionality. The routing protocols are used to adapt dynamically to the variations in networks structures and also to the possible failures occurring during various stages of transmission of the data packets.

SUMMARY OF THE INVENTION

The routing protocols, like OSPF (Open Shortest Path First) and BGP (Border Gateway Protocol), are substantially complex and do not suit especially well to simple network elements the NAS otherwise would utilise. Thus the integration of the routing protocols to each NAS unit of the network system is in most cases an excessively complex task, and requires otherwise unnecessary modifications and/or additional hardware and/or software implementations to each of the access servers in the system.

In case separate routers are used the routing causes one extra step, and every packet has to be handled still once in the NAS. This may cause delays in the traffic and increases the risk for failures.

The current development is leading towards a model in which the PSTN network control is separated from the NAS to a signalling gateway (SG; SS7 to ISUP over IP conversion) and Media Gateway Controller (MGC) handling the PSTN call related control, whereby NAS remains only as a simple Media Gateway (MG). A MG typically contains only one generic DSP (Digital Signal Processor) that can be programmed

dynamically to form a modem or a voice over IP codec. This simplifies the structure of the MG (i.e. the access node for media) a lot, but does not solve the routing problem.

It is an object of the present invention to overcome the disadvantages of the prior art solutions and to provide a new type of solution for routing calls between different networks.

Another object of the present invention is to provide a method and arrangement by means of which the structure of the access node can be made less complex and unnecessary double processing of the data packets can be avoided.

According to a first aspect, the objects are obtained by a method of routing a call between a circuit switched network and a packet switched network in a network system comprising a media gateway between the circuit switched network and the packet switched network, wherein routing procedures for the call are handled by a separate routing controller common for several media gateways.

The routing controller can give routing information to an appropriate media gateway concerning the destination of the call traffic. The routing information may comprise the IP interface to be used and the IP address of the next router in the packet switched network. The routing controller for the packet switched network and signalling controller for the circuit switched network may also form a symmetric structure relative to the media gateway. The call can originate both from the circuit switched network side and the packet switched network side.

According to another aspect the invention provides an arrangement in a communication network system comprising: a

circuit switched network; a packet switched network; a plurality of media gateways between the networks; a signalling controller for handling circuit switched traffic; and a separate routing controller for handling packet switched traffic routing, said separate routing controller being common to said plurality of media gateways.

The routing controller and the signalling controller can form a symmetric structure relative to the media gateway. The plurality of media gateways can also be arranged in a stack.

According to a further aspect the invention provides a routing controller for a communication network system comprising a circuit switched network, a packet switched network, a plurality of media gateways between the networks, and a signalling controller for handling circuit switched traffic, wherein the routing controller is arranged to form a separate routing controller for handling packet switched traffic routing such that said separate routing controller is common to said plurality of media gateways.

Several advantages are obtained by means of the present invention, since the solution provides a simplified structure for the media gateway between different communications networks. Since the required media gateway apparatus is less complex than in the prior art solutions, it is thus economically more advantageous and also more reliable in use and less vulnerable for hardware and/or software failures. The proposed solution does not have any disadvantageous effects in the performance or functionality of the system since the traffic is separated to different outgoing interfaces. The proposed system adapts well to any dynamic changes in the network system. In addition, by means of the invention it becomes more easy to stack media gateway

units to a tight space.

In the following the present invention and the other objects and advantages thereof will be described in an exemplifying manner with reference to the annexed drawings, in which similar reference characters throughout the various figures refer to similar features.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic presentation of network system including a telephone network and a data network and linking apparatus there between; and

Figure 2 discloses signalling flow according to one embodiment of the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematical presentation of one network system including a PSTN 1, IP network 2 (e.g. the TCP/IP Internet or an intranet application) and an access node or a gateway apparatus therebetween. The arrows indicate the signalling directions in situation where a call has been initiated by a terminal of the PSTN (not shown). In this example the gateway apparatus comprises a plurality of media gateways 3, 3', a signalling gateway SG (for SS7 to ISUP over IP conversion) and media gateway controller MGC handling call related control 4.

Each MG 3,3' may contain only one generic DSP (Digital Signal Processor) which can be programmed dynamically to form a modem or a voice over IP codec. Thus the structure of the MG can be made substantially simple, which reduces remarkably the costs of the MG and also increases the reliability of the MG. As disclosed, the MGs can be stacked

in a substantially tight space in a manner similar to ordinary telephone exchanges. It is noted that even though figure 1 discloses only two MGs, the number of them could be substantially higher.

The gateway apparatus is further provided with a separate routing controller RC 5, the arrangement being such that the routing is separated similarly to the signalling gateway and media gateway controller 4 to the routing controller 5. In other words, the system is "symmetric" relative to the MGs in view of the PSTN and the IP network. Thus the former access servers are now simplified to form only media gateway units 3,3'.

In a manner similar to the SG+MGC unit 4, the routing controller unit 5 is common for several media gateway units 3,3'. The routing controller 5 is arranged to communicate to the IP network 2 by using appropriate routing protocols, such as the OSPF and the BGP, and to give required routing orders to the particular media gateway unit 3 or 3'. The main information required by the particular media gateway is the current situation concerning the destination of the traffic originating in the PSTN side and coming via a certain PSTN line. The required information typically consists of indication of correct IP interface which should be used and the IP address of the next router (i.e. the next "hop" in the data network).

An example of the routing protocols is the OSPF routing protocol (RFC2178) which is one of the IP protocols, more precisely IP protocol number 89. All those IP packets that are coming to the media gateway MG and are of protocol 89 are tunnelled to the routing controller RC. The routing controller 5 sees all MG interfaces as its own interfaces, and when something is sent to a RC interface, it is

tunnelled to the MG and sent there. There are 5 types of OSPF packets and they all must fit in to an IP packet of size of 576 bytes (in case operated according to RFC2178 appendix A). Another typical protocol is RIP (RFC1723) that is a UDP based protocol (a transport level datagram layer above the IP layer, port 520). A similar tunnelling approach works in this as well when the traffic from UDP port 520 is forwarded to the routing controller.

The media gateway MG unit can be made as simple as possible by removing both IP routing handling and call control from it. This does not affect negatively to the performance or the functionality of the system because the traffic is separated to different outgoing ("egress") interfaces in a manner similar to a router. The system also adapts to any dynamic changes in the network in a manner similar to a router.

The PSTN users often have a dynamically assigned IP address. In this case the RC must "advertise" (i.e. announce) these addresses so that the other routers of the system are enabled to transmit the data packets to a correct MG.

It is also possible for an PSTN user to have a known IP network address or a subnet of an IP network. In this case the RC can call back to the PSTN telephone number associated with this IP address when somebody tries to reach said IP address from the IP network side. In case the connection has already been setup, this case will be like the one already discussed above.

The RC advertises routes to the fixed network addresses even in instances where the connections are down i.e. disconnected. The RC can accomplish this by using one, some or available ports based on local policy (for instance, some

MGs may be closer to the destination in the PSTN). When a packet addressed to a predefined destination arrives, the MG routes it to a special dynamic interface that makes the SG to set-up the requested telephone call. This may involve utilisation of one additional server, e.g. an AAA server (Authentication, Authorisation and Accounting server; most often used protocol for an AAA server being RADIUS) that maintains customer information in a database which is common for the SC and the RC.

Figure 2 discloses signalling flows 11 to 13 (numbers in circles) for the above described solution. At flow step 11 the AAA server 7 defines fixed routes and the RC 5 controls that the MG 3 becomes advertised of the addresses and sets up the MG 3 to start a connection should a data packet arrive. In flow step 12 a data packet arrives, whereafter the MG 3 contacts SG/MGC 4 in order to establish a connection. SG 4 ask for a telephone number from the AAA server 7 and establishes the connection to that number. Then the MG 3 forwards the data packet to the established connection 13. In case the same route is advertised in many MGs, it must in most cases be ensured that only one connection is established at the same time. However, there may be instances where it could be desirable to establish several connections, e.g. such that the user can receive several calls at the same time and/or that the bandwidth is increased by this and/or that the call may go to many geographical locations at the same time.

Thus the invention provides an apparatus and a method by which a significant improvement can be achieved in the area of routing between different networks. It should be noted that the foregoing exemplifying embodiments of the invention are not intended to restrict the scope of the invention to the specific forms presented above but the present invention

is meant rather to cover all modifications, similarities and alternatives which are included in the spirit and scope of the present invention, as defined by the appended claims.

Claims

Claims

1. A method of routing a call between a circuit switched network and a packet switched network in a network system comprising a media gateway between the circuit switched network and the packet switched network, wherein routing procedures for the call are handled by a separate routing controller common for several media gateways.

2. A method in accordance with claim 1, wherein the routing controller gives routing information to an appropriate media gateway concerning the destination of the call traffic.

3. A method in accordance with claim 2, wherein the routing information comprises the IP interface to be used and the IP address of the next router in the packet switched network.

4. A method in accordance with any of the preceding claims, wherein the routing controller for the packet switched network and signalling controller for the circuit switched network form a symmetric structure relative to the media gateway.

5. A method in accordance with any of the preceding claims, wherein the call comes to the media gateway from the circuit switched network side.

6. A method in accordance with any of claims 1 to 4, wherein the call comes to the media gateway from the packet switched network side and is destined to a terminal connected to the circuit switched network.

7. A method in accordance with claim 6, wherein, in case the terminal has a dynamically assigned IP address, the IP

address of the terminal is advertised by the routing controller to routers of the system.

8. A method in accordance with claim 6, wherein, in case the terminal has a known IP address, the routing controller calls back to a called circuit switched terminal number associated with said IP address.

9. An arrangement in a communication network system comprising:

a circuit switched network;

a packet switched network;

a plurality of media gateways between the networks;

a signalling controller for handling circuit switched traffic; and

a separate routing controller for handling packet switched traffic routing, said separate routing controller being common to said plurality of media gateways.

10. An arrangement in accordance with claim 9, wherein the routing controller and the signalling controller form a symmetric structure relative to the media gateway.

11. An arrangement in accordance with claim 9 or 10, wherein the plurality of media gateways is arranged in a stack.

12. A routing controller for a communication network system comprising a circuit switched network, a packet switched network, a plurality of media gateways between the networks, and a signalling controller for handling circuit switched traffic, wherein the routing controller is arranged to form a separate routing controller for handling packet switched traffic routing such that said separate routing controller is common to said plurality of media gateways.

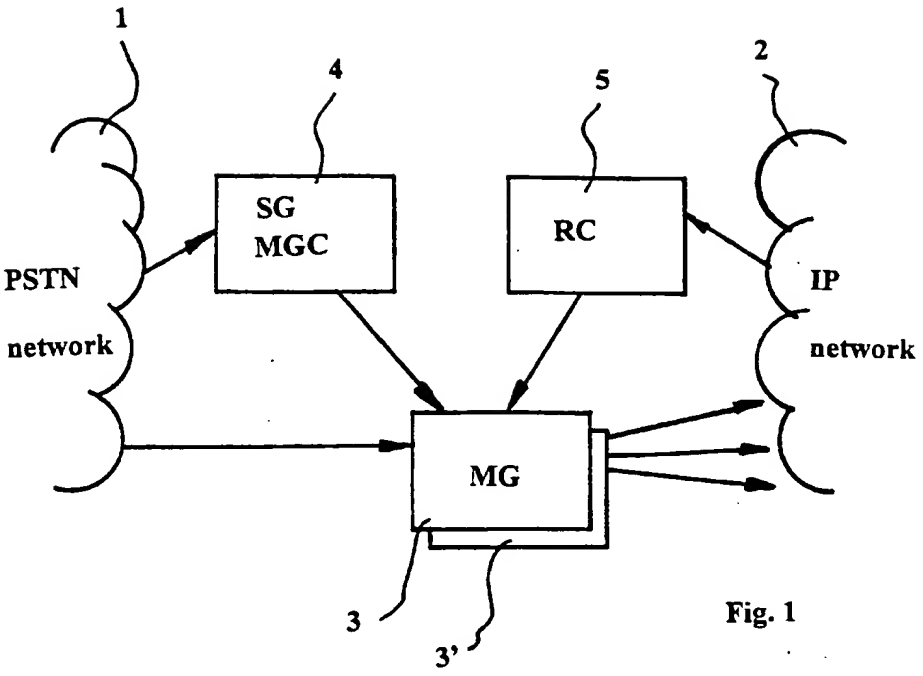
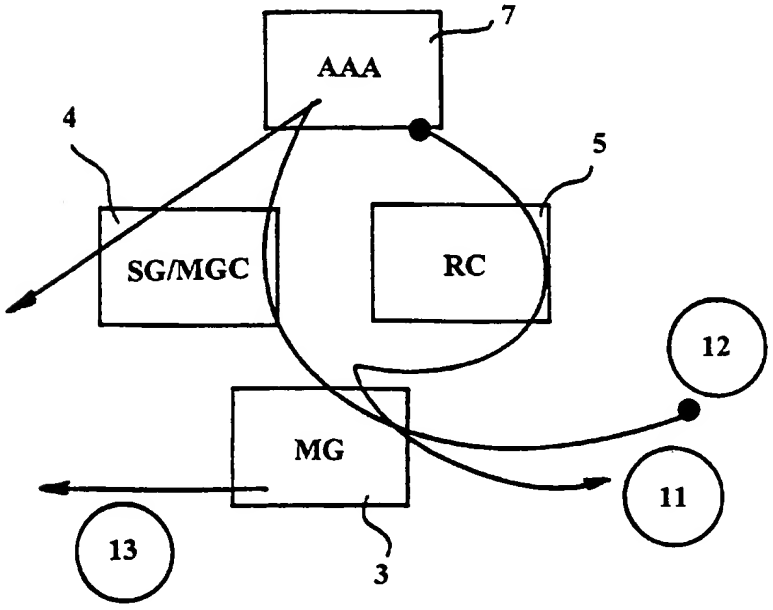

1
4
5
2
SG
MGC
RC
PSTN
network
IP
network
MG
3
3'

Fig. 1

Fig. 2


7
AAA
4
5
SG/MGC
RC
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MG
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13
3

INTERNATIONAL SEARCH REPORT

International Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04L12/56 H04L12/66 H04L12/46 H04Q11/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04L H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 546 452 A (ANDREWS G W ET AL) 13 August 1996 (1996-08-13) column 2, line 35 -column 3, line 10 column 5, line 20 - line 50 column 7, line 25 - line 41; figures 1-3	1-6,8-12
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X	EP 0 880 255 A (NORTHERN TELECOM LTD) 25 November 1998 (1998-11-25) column 4, line 3 - line 47 column 6, line 37 - line 57 column 8, line 45 -column 9, line 5 column 9, line 25 - line 43; figure 1	1-6,8-11

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
25 July 2000	28. 08. 2000

Name and mailing address of the ISA	Authorized officer
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